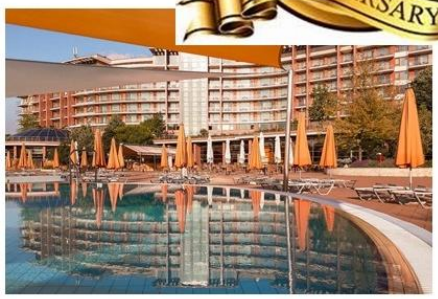
PLENARY TALK



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Topological Intelligence for Robot Partners Based on Perceiving-acting Cycle

Naoyuki Kubota

Tokyo Metropolitan University
Tokyo, Japan
kubota@tmu.ac.jp

Abstract: Topological intelligence with a set of nodes and their edges has been used for the inference, prediction, search, and learning of various types of robots including mobile robots, robot manipulators, and robot partners. Especially, the relationship between humans, robots, and surroundings is changing over time in human-robot interactions. This means that the topological structure representing these relationships must be updated according to the joint attention of humans and robots. The attention mechanism based on perceiving-acting cycle in ecological psychology is useful for updating the topological structure in ongoing human-robot interactions. The study of topological intelligence can be divided into two main categories: topological mapping which generates and updates topological structures represented as topological twin, and topological inference which uses these topological structures. Topological intelligence is used complementally with physical AI. First, this talk introduces the methodology of topological intelligence, and explains how to apply the topological intelligence to robot partners. Finally, I discuss the applicability of topological intelligence in robotics and its future directions.

Biography:

Naoyuki Kubota is currently a professor in the Department of Mechanical Systems Engineering, the Graduate School of Systems Design, and director of the Community-centric Systems Research Center, Tokyo Metropolitan University, Japan. He is the representative director of the Tokyo Biomarker Innovation Research Association, Japan. He received his Ph.D. degree from Nagoya University, Japan, in 1997. He was a Visiting Professor at University of Portsmouth, UK, Seoul National University, and others. His current interests are in the areas of topological intelligence, coevolutionary computation, spiking neural networks, robot partners, and informationally structured space. He has published more than 600 peer-reviewed journal and conference papers in the above research areas. He received the Best Paper Award of IEEE IECON 1996, IEEE CIRA 1997, and so on. He was an associate editor of the IEEE Transactions on Fuzzy Systems from 1999 to 2010, Editorial Board Member of Journal of Advanced Computational Intelligence and Intelligent Informatics since 2004, the IEEE CIS Intelligent Systems Applications Technical Committee, Robotics Task Force Chair from 2007 to 2014, Editor of ROBOMECH Journal since 2012, IEEE Systems, Man, and Cybernetics Society, Japan Chapter Chair from 2018 to 2021, IEEE Transactions on Affective Computing Steering Committee Member since 2019, and others.